SHINKO DENSHI CO., LTD.

Tuning-fork Analytical Balance

HTR Series

Service Manual



(subject to technical modification)

Ver. 1.0

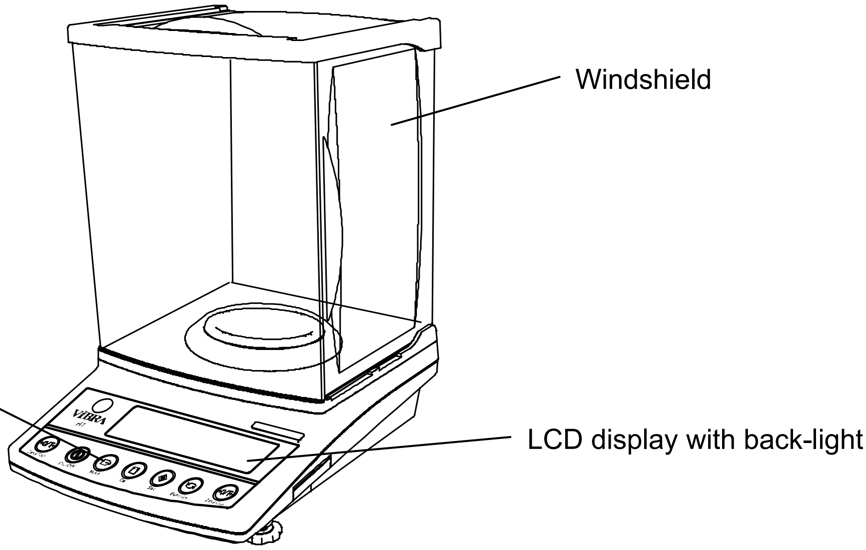
CONTENTS

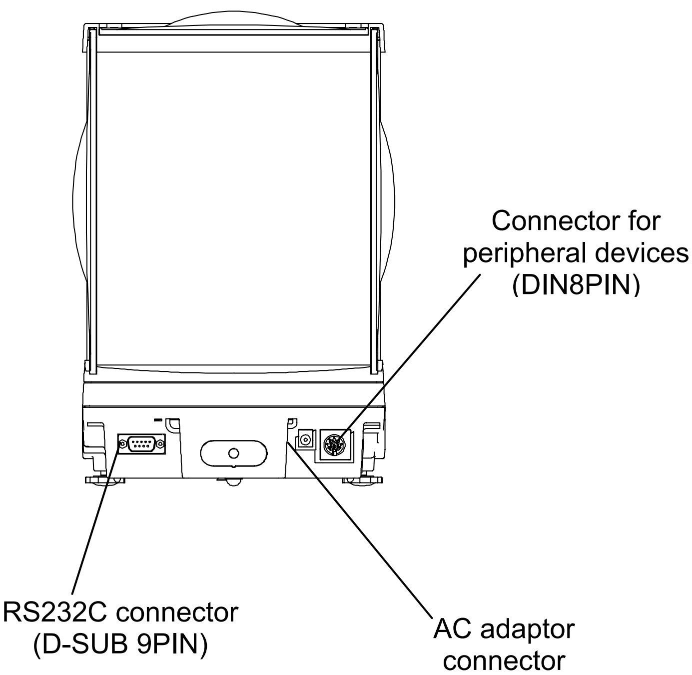
Chapter 1　Total View

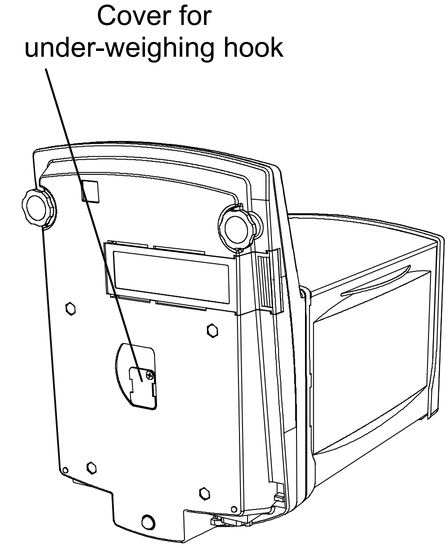
External weight type
HT-80(C)E, HT-120(C)E, HT-220(C)E

Internal weight type
HTR-80(C)E, HTR-120(C)E, HTR-220(C)E



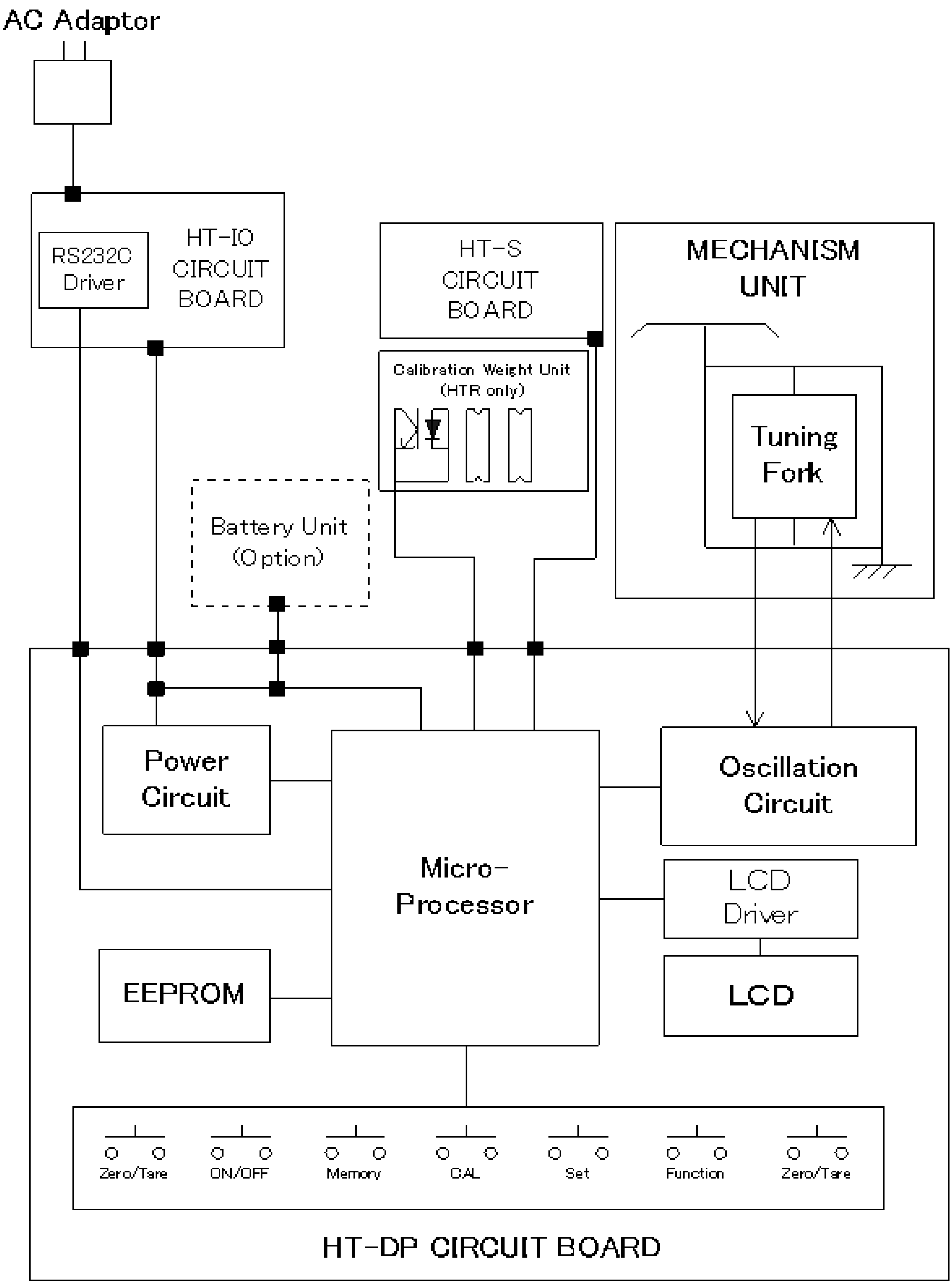




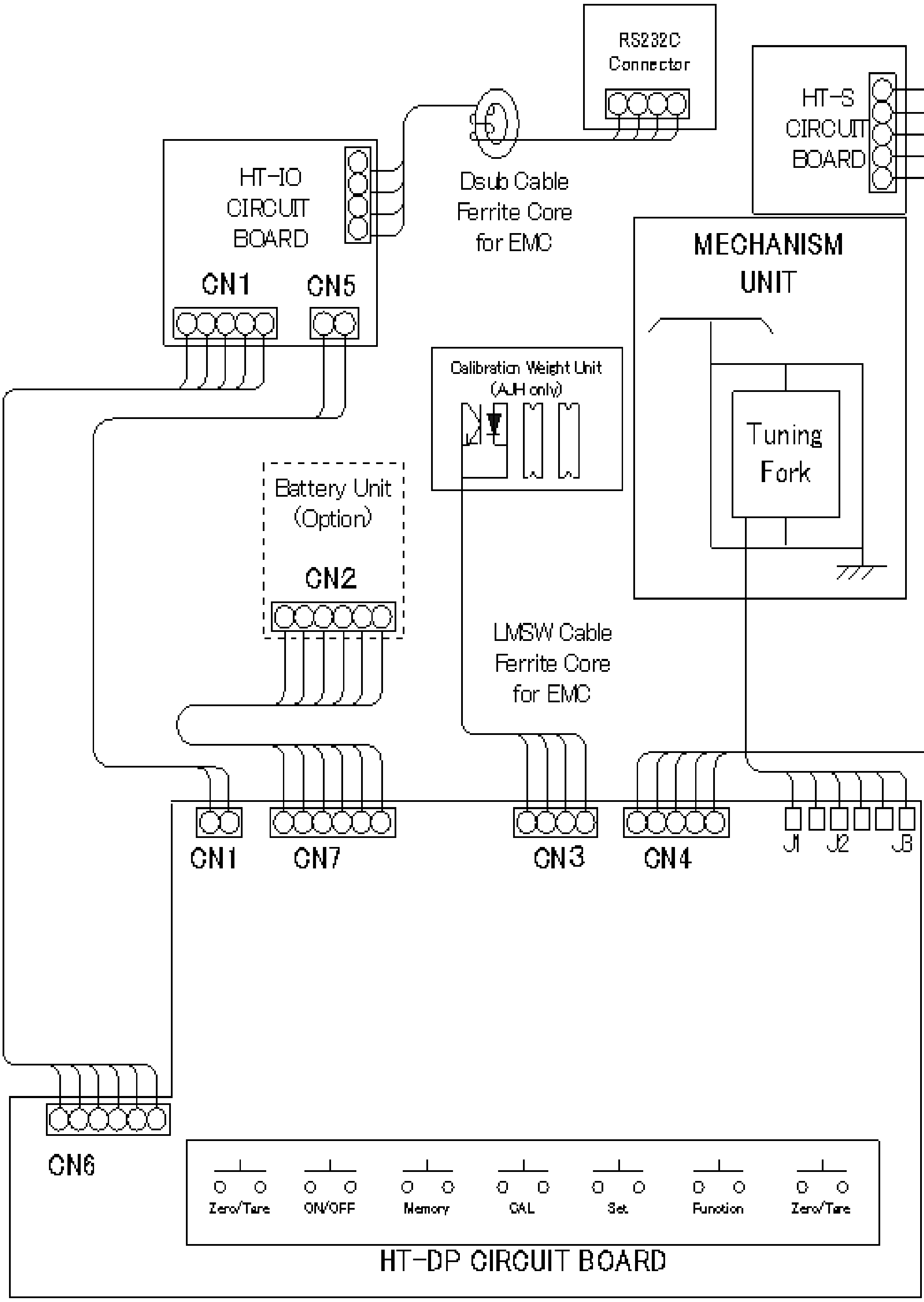


Chapter2 Electric/Electronic Construction

2-1 Block Diagram

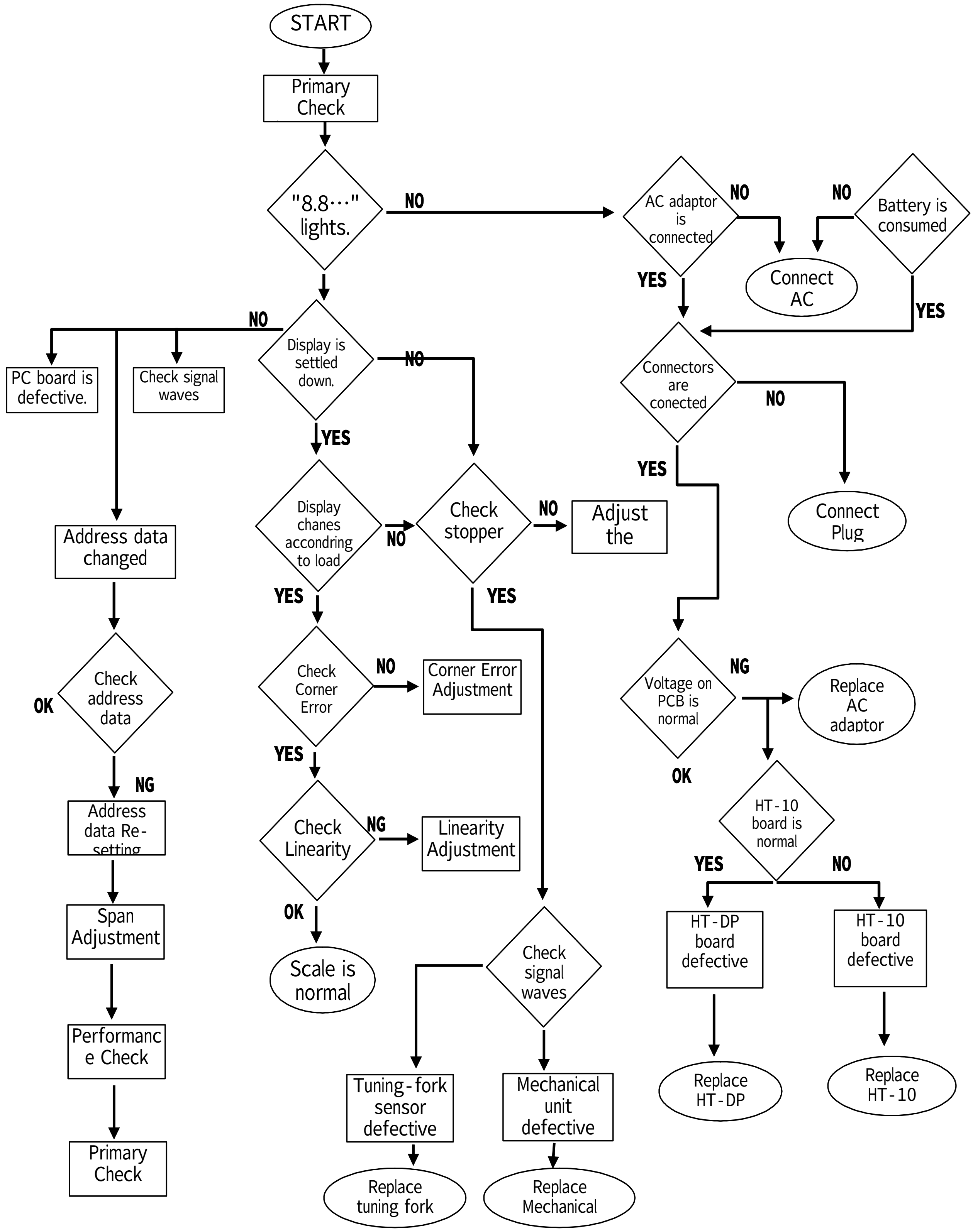


2-2 Whole Wiring



Chapter 3 Troubleshooting

3-1 Troubleshooting Procedure



3-2 Troubleshooting Table

SYMPTOMS	CAUSES & REMEDY
No display lights on.	1. HT-DP board is defective. 2. AC adaptor is defective. 3. Inner connecting cord is not properly connected. 4. Battery is consumed.
「u-Err」 or 「o-Err」 appears on the display.	1. Wrong weighing pan is applied. 2. Tuning-fork sensor or mechanical unit is defective. 3. HT-DP board is defective. 4. Setting of address data has mistake. 5. Coefficient memories (address data) have changed by noise or static electricity. Re-set the address data and/or adjust the linearity.
Display does not get settled down. Display does not repeat correctly. Zero point drifts.	1. Some parts such as stopper touches others. 2. Weighing pan touches other parts. 3. Foreign substances is in the scale. 4. Tuning-fork sensor or mechanical unit is defective. 5. Affected by wind or disturbing oscillation.
「o-Err」 appears with net load less than full capacity.	1. Gross weight applied to the scale pan (net weight + tare value) exceeds the scale capacity. 2. Setting of address data has mistake. 3. Coefficient memories (address data) have changed by noise or static electricity. Re-set the address data and/or adjust the linearity. 4. Wrong external weight is used in the span calibration.
Span error is too much.	1. Tuning-fork sensor or mechanical unit is defective. 2. HT-DP board is defective. 5. Setting of address data has mistake. 3. Coefficient memories (address data) have changed by noise or static electricity. Re-set the address data and/or adjust the linearity.
Non-linearity is too much.	1. Tuning-fork sensor or mechanical unit is defective. 2. Setting of address data has mistake. 3. Coefficient memories (address data) have changed by noises or static electricity. Re-set the address data and/or adjust the linearity. 4. Wrong external weight is used in span calibration.

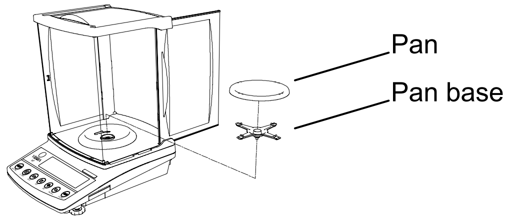
SYMPTOMS	CAUSES & REMEDY
Corner Error is too much.	1. Mechanical unit is defective. Leaf spring is bent or twisted. 2. Pan base touches other parts.
Display suddenly disappeared.	1. Battery is being consumed. 2. HT-DP board is defective. 3. AC adaptor is defective.
「b-Err」 or 「d-Err」 appears.	1. HT-DP board is defective. 2. Coefficient memories (address data) have changed by noises or static electricity. Re-set the address data and/or adjust the linearity.
「L-Err」 appears.	1. The weight of reference sample is too light (% mode, counting mode).
「1-Err」 appears.	1. Wrong external weight is used in span calibration (external weight must be more than 50% of the scale capacity).
「2-Err」 appears.	1. Span error exceeds 1% of the scale capacity in span calibration. Check the applied external weight.
「5-Err」 appears.	1. Interval of output is not properly set (see 16-10 in HT user's manual).
「C-Err」 appears.	1. Internal clock is defective. Check internal clock and replace HT-DP board, if necessary.
「r-Err」 appears.	1. The weight error exceeds ±100.00mg. Re-set the weight error within ±100.00mg (see 14-6 in HT user's manual).
「t-Err」 appears.	1. Wrong operation in Cumulate Function or Net Addition Function (see 12 in HT user's manual).

3-3 Primary Check

1. Is there any wind around the site? Is there any oscillation?

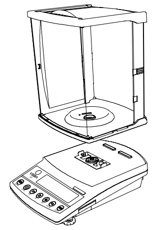
2. Is anything under the pan base or the weighing pan?

3. Is the weighing pan right one?



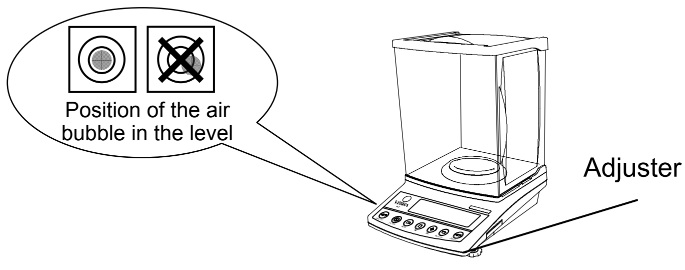
When you attach or remove pan, pan base, windshield, take care no dust and/or liquid gets into the balance nor under pan/pan base.

4. Is the windshield properly attached?

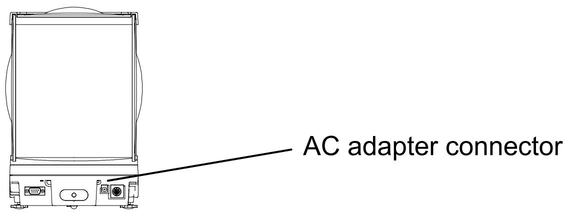


5. The working table is stable?

6. The balance is installed in level?

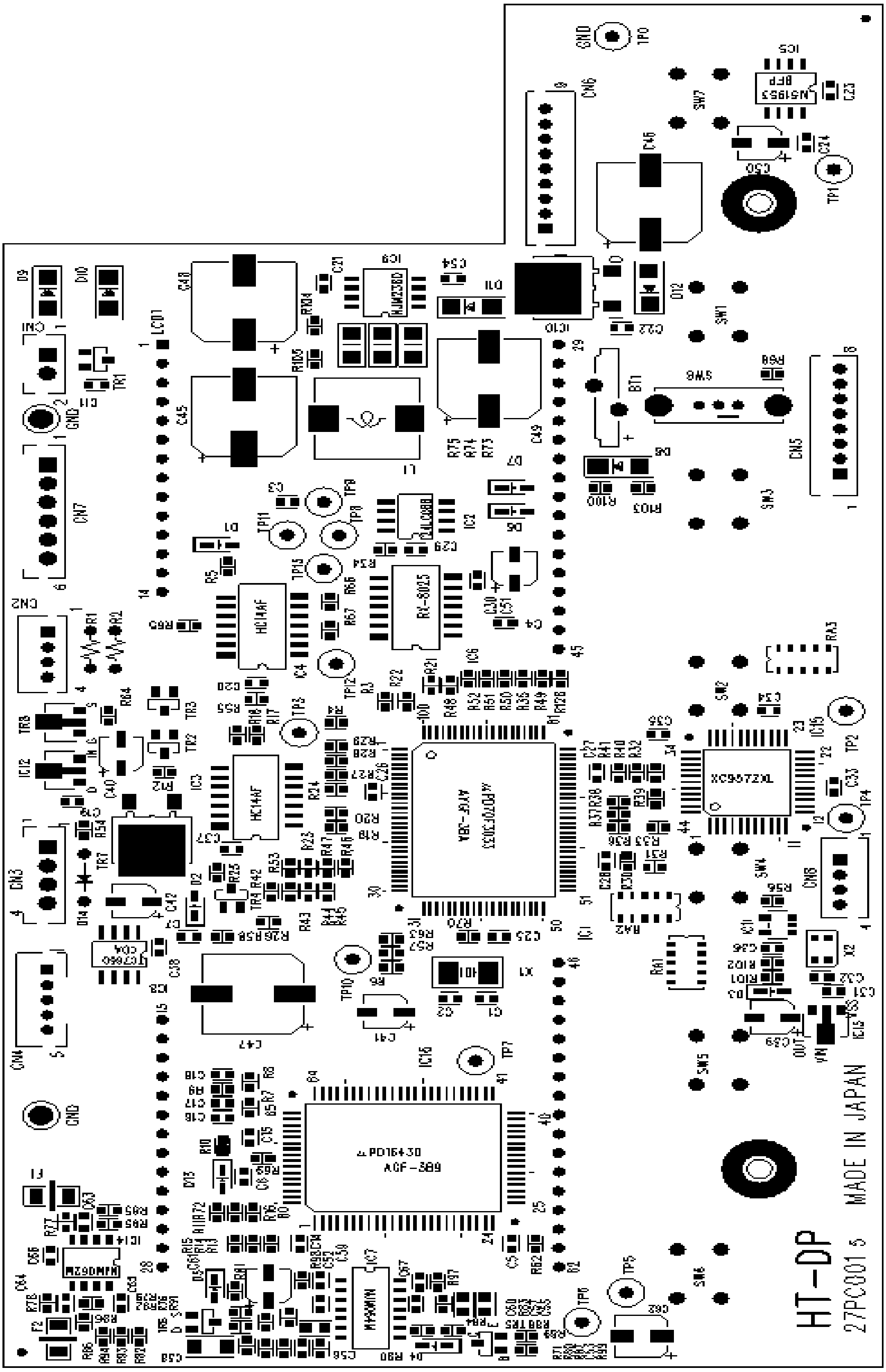


7. AC adaptor is properly connected both with the scale and with outlet?



3-4 Check of Electric/Electronic Parts

1. Check of HT-DP board



2. Check of input voltage

TP0 – CN1-1 ･････ + 9V～ + 14V

3. Power voltage in the circuit

TP0 – TP1 ･････ + 4.75V～ +5.25V

TP0 – TP2 ･････ + 3.15V～ +3.45V

TP0 – IC12-O ･････ +7.6V～ +8.4V

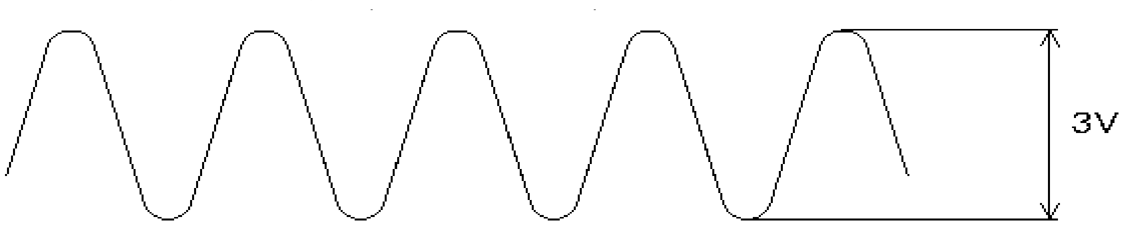
TP0 – IC13-OUT ･････ +2.65V～ +2.95V

TP0 – D3 kasode ･････ +2.0V～ +2.4V

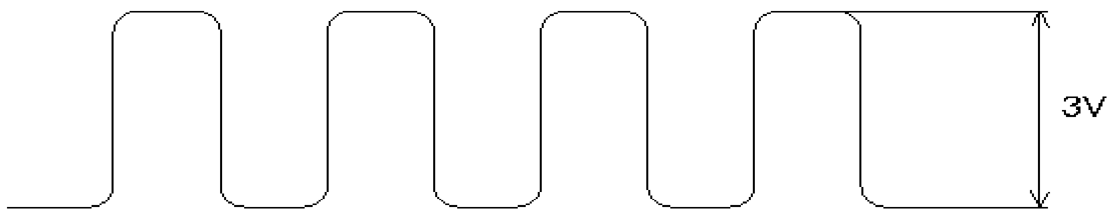
TP0- IC8-5 ･････ -8.4V～ -7.6V

4. Check of signal waves

TP0 – IC1-39 (19.968MHz)



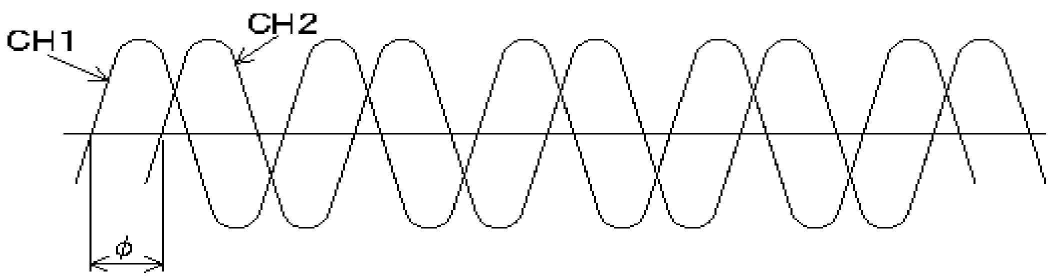
TP0 – TP4 (38.4MHz)



Check of tuning-fork vibration (800～1000Hz)

CH1 : TP0 – TP6 P-P 200mv or more

CH2 : TP0 – TP5 P-P 9V or more



ϕ ･････ 70 ° ～ 100 °

Chapter 4　Adjustment and Setting

4-1　Span calibration

1. Calibration with built-in weight (HTR only)

a. Push [ON/OFF] to power ON. 「8.8.8.･･･」, then 「0.000 g」 appears.

b. Push [CAL]. 「Aut. CAL」 appears.

c. When 「PuSH C」 is displayed, push [CAL] again.

d. The built-in weight unit starts to operate, and the balance will automatically start span calibration.

e. The display changes in the order of
「Aut. CAL」→「CH. 0」→「CH. F.S.」→「buSY」→「End」
When span adjustment is completed, the display returns to weighing mode.

2. Calibration with external weight {for HTR, available only with function setting 「8. CA. 3」 (see user's manual "5.2 description of function")}

a. Push [ON/OFF] to power ON. 「8.8.8.･･･」, then 「0.000 g」 appears.

b. Push [CAL]. 「CAL EHt」 appears.

c. When 「PuSH C」 is displayed, push [CAL] again.

d. 「CAL EHt」 appears again, then 「on 0」 starts blinking. Zero point adjustment is automatically performed.

e. When 「on F.S.」 appears, put the external weight around the center of the pan. Display starts blinking to adjust the span automatically.

f. 「buSY」→「End」 appear in sequence. The span calibration is completed and the balance automatically returns to weighing mode.

3. Calibration of internal weight (HTR only)

a. Set [3. r.CA. 1] in function 2 (for function setting, see 14.5 in HT user's manual).
Push [Function] to display [rEF. CAL].

b. While pressing [Zero/Tare] , push [Function] together, and release both keys.
[on 0] starts blinking and [on F.S.] appears.

c. Put the external weight of full capacity on the pan.

d. [on F.S.] starts blinking, and the display changes to [on 0].

e. Remove the external weight from the pan.

f. The display changes [CH. 0]→[CH. F.S.]→[End]. When the calibration is successfully completed, [4. M.E.H.] appears on the display.

g. Push [Function] to return to weight display screen.

4. Hints for span calibration

a. The span calibration can be performed with external weight of 1/2 of full capacity. Nevertheless, it is recommended to use weight closer to full capacity for accurate calibration.

b. Error messages

「o - Err」: The external weight is heavier than full capacity.
「1 - Err」: The external weight is lighter than 1/2 of full capacity.
「2 - Err」: The data error exceeds 1% of the full capacity.
「3 - Err」: Any object is put on the pan during calibration procedure.
「4 - Err」: The weight error exceeds 10% of
「A - Err」: The internal drive unit malfunctioned during span calibration.

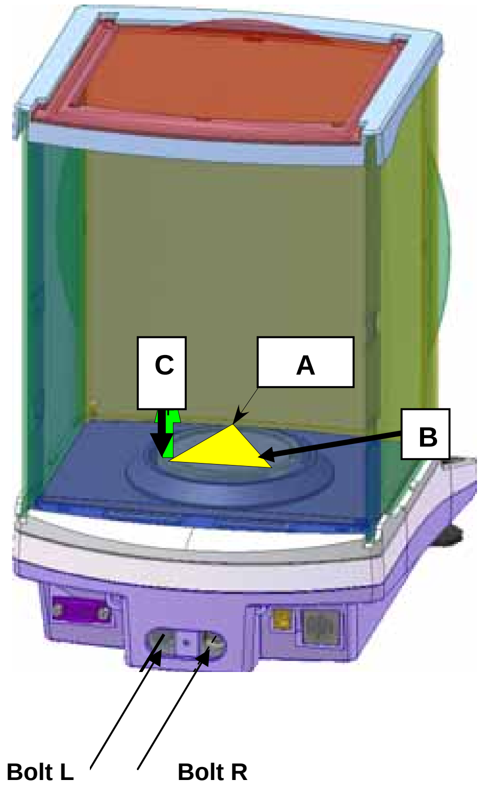
When one of these messages is displayed, calibration will not be performed.

c. When you want to stop the calibration, push [SET]. The balance goes back to the weighing mode.

4-2 Corner Error Adjustment

1. Turn the adjusting legs to bring the bubble of the level to the center of the circle.
2. Put the full scale weight at "**A**" and Push →0/T← [Zero/Tare].

3. Move the weight to **B** and **C**. To adjust bolts **R** and **L** referring to the table below so that the corner error is within the specified range.



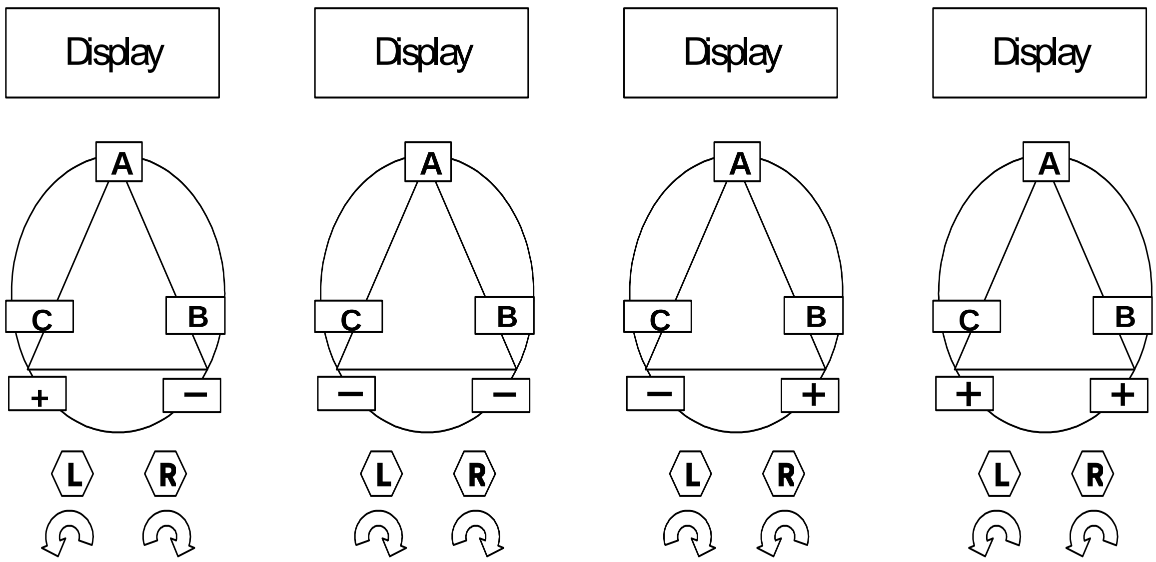
<corner error adjustment table>

+: Error is positive to the center

−: Error is negative to the center

↻ Drive the bolt clockwise

↺ Drive the bolt counter-clockwise



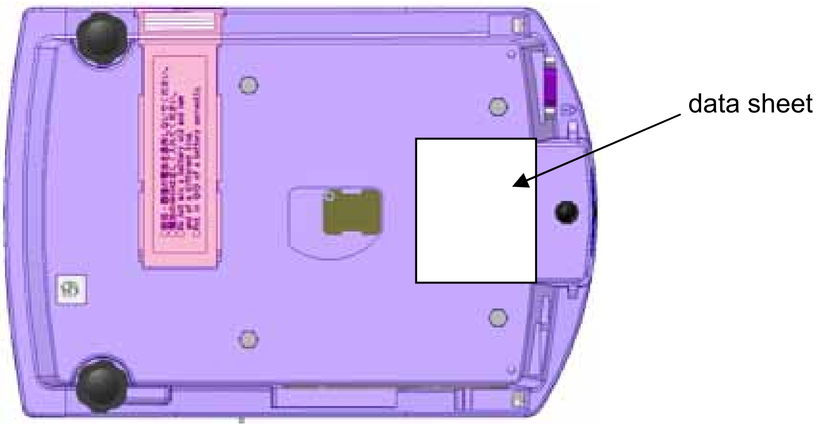
4-3 Address Data Check and Re-setting

a. Why do you need to re-set the address data, and in which case?

"Address data" (coefficient memories) sometimes changes by noise in the environment or by static electricity. You can re-set the address data so as to bring back the balance to the initial factory condition.

Address data (coefficient memories) changed → Re-set address data → Span Calibration (see 4-1) → Primary Check (see 3-3)

You can find the address data sheet on the bottom of the balance.



How to read the address data sheet

Number of Tuning fork: S=81S073
Program number: P=AJ0004

Address data sheet	
S=81S073 P=AJ0004 3003	
00-9A,57,41,98,22,12,9B,32	From left to right : Add. 00～07
08-85,19,30,00,27,56,62,80	From left to right : Add. 08～0F
10-00,18,27,39,26,72,17,12	From left to right : Add. 10～17
18-99,72,27,8D,49,27,61,48	From left to right : Add. 18～1F
20-84,33,77,69,92,20,20,00	From left to right : Add. 20～27
28-00,00,20,10,00,00,00,0A	From left to right : Add. 28～2F
30-06,07,02,0B,07,00,00,FF	From left to right : Add. 30～37
38-1C,0B,14,53,0A,00,00,00	From left to right : Add. 38～3F
40-00,00,00,00,00,00,00,00	From left to right : Add. 40～47
48-00,00,5F	From left to right : Add. 48～4A

b. How to re-set the address data

1. While pressing [Zero/Tare] and [Function], and turn the power switch ON
   You can enter "maintenance mode".

2. Press and hold [Function]. When「CAL 2」appears on the display, release the key. Press and hold [Function] again, and when「Addr.」appears on the display, release the key.

3. The first address data (Addr. Number 00) is displayed. 「000.XX」 (data: XX; Addr. No.: 00)

4. Press [Zero/Tare], 「000.XX. 0.」appears. Every time [Zero/Tare] is pressed, the numerical number changes as 「0→1→2・・・E→F→0」.
   Example : To set 「9A」 at addr. No. 「00」, select 「9」 as the first step.
   「000.XX. 9 」.

5. Press [Function] once, then numerical number (「9」 in this case) shifts to upper digit.
   「000.XX.9 」.

6. Press [Zero/Tare] again to display a numerical number at the right side.
   「000.XX.90.」

7. Press [Zero/Tare] key to select 「A」 in the right side. By pressing [Function], you set 「9A」 in addr. 「00.」 and move to next address.

8. Input other data by the same procedure. When you set data in all the address, the balance returns to weight display screen.

- Even after you set all data and return to weight display screen, the balance is still in the maintenance mode. In order to exit from the maintenance mode, please turn the power switch OFF.
- If you want to stop address data setting, you push [Set] and return to weight display screen in the maintenance mode.

4-4 Linearity Adjustment

a. Linearity adjustment of HT(R)-80 and HT(R)-120

1. While pressing [Zero/Tare] and [Function], and turn the power switch ON. You can enter "maintenance mode".

2. Press [Function] until 「CAL2」 appears after displaying 「FunC」.

3. While Pressing [Zero/Tare] first, press [Function] together, and release both.

4. 「on 0」 starts blinking in the display. Zero adjustment is automatically performed.

5. When display changes to 「on 1」 blinking, put the external weight according to the table below. (「on 1」～「on 4」).

6. When 「on 5」 appears in the display, press [Function]. The display changes to 「buSY」, and returns to weight display screen.

	HT(R)-80 additional loaded weight (accumulated load)	**HT(R)-120** additional loaded weight (accumulated load)
on0	0g (0g)	0g (0g)
on 1	20g (20g)	30g (30g)
on2	20g (40g)	30g (60g)
on 3	20g (60g)	30g (90g)
on 4	20g (80g)	30g (120g)

b. Linearity adjustment of HT(R)-220

1. While pressing [Zero/Tare] and [Function], and turn the power switch ON. You can enter “maintenance mode”.

2. Press [Function] until 「CAL 2」 appears after displaying 「FunC」.

3. While Pressing [Zero/Tare] first, press [Function] together, and keep pressing both. When 「CAL 4」 appears in the display, release both keys.

4. While Pressing [Zero/Tare] first, press [Function] together, and release both.

5. 「on 0」 starts blinking in the display. Zero adjustment is automatically performed.

6. When 「on 0.5」 appears, put the external weight of 100g. The display changes to 「on F5」, put additional 120g (220g in accumulate).

7. 「on 0.5」 appears again and remove 120g (100g remains on the pan). The display changes to 「on 0」 and remove 100g.

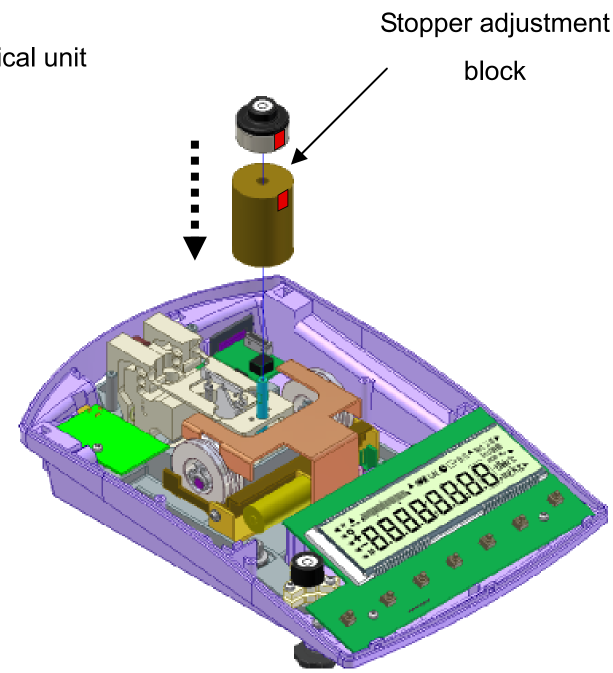
8. When display changes to 「on 1」 blinking, put the external weight according to the table below. (「on 1」 ~ 「on5」). *you don’t need to push [Function] key when “0n5” appears.

9. The display changes to 「bu5y」, and returns to weight display screen.

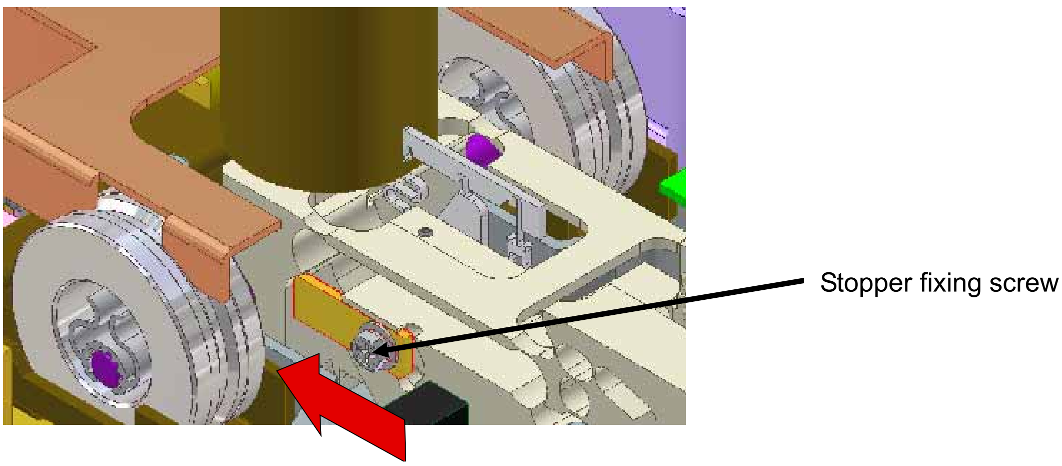
	HT(R)-220 additional loaded weight (accumulated load)
on0	0g (0g)
on 1	50g (50g)
on2	50g (100g)
on3	50g (150g)
on4	50g (200g)
on5	20g (220g)

4-5 Adjustment of Over-load Stopper

1. Enter "maintenance mode". (see 4-3 and 4-4).
2. Put "stopper adjustment block" on the mechanical unit referring to the picture.
3. Adjust the level of the balance.



4. Lose stopper fixing screw on the side of mechanical unit.
5. Press →0/T← [Zero/Tare] and check whether the indication is stable.
6. Adjust the stopper by sliding the stopper (the stopper should slightly touch with guide-link)
7. Fix the stopper fixing screw



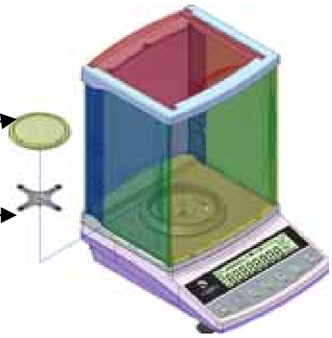
Chapter 5　Parts Replacement

5-1 How to Remove the Case

1. Remove the weighing pan and pan base.

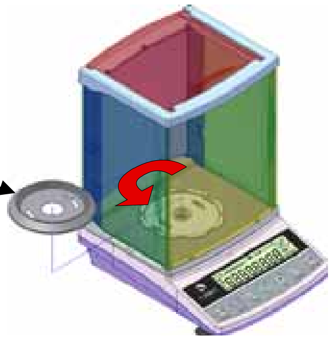
Weighing Pan

Pan Base

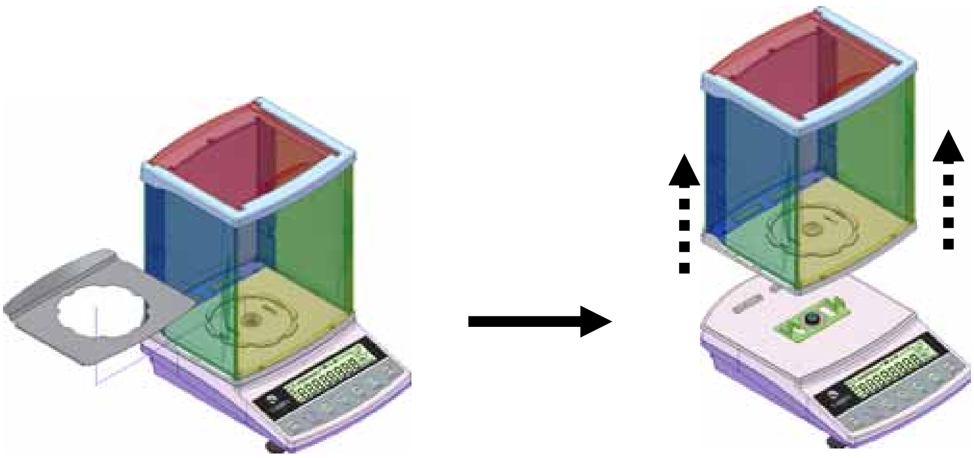


2. Remove the WS Ring by turning it counter-clockwise.

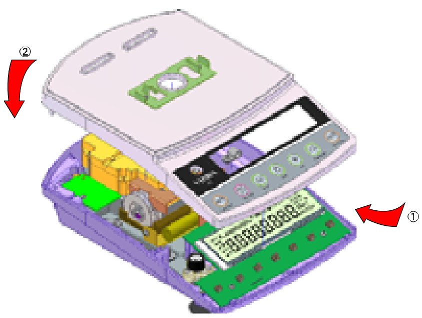
WS Ring



3. Remove the windshield.



4. Remove the upper case.



5-2 The Sequence of HT-DP Board Replacement

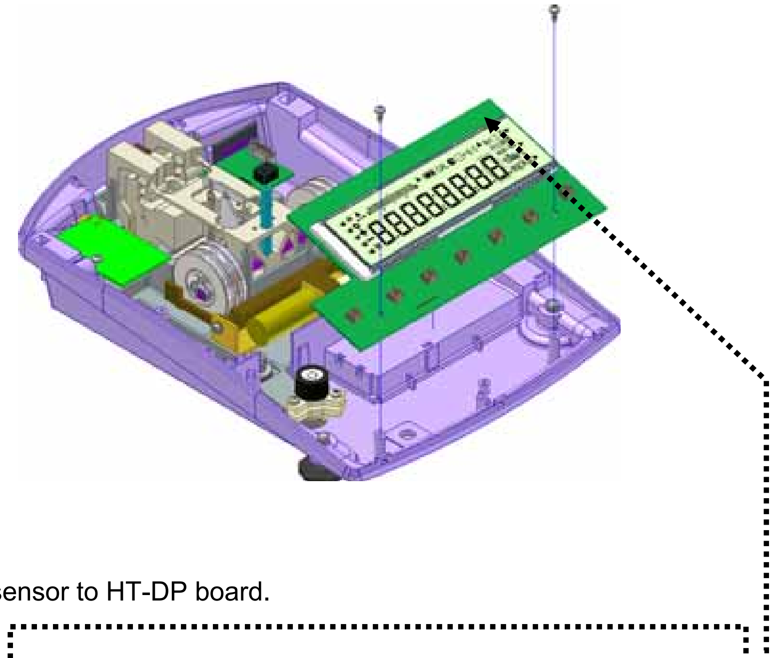
1. How to replace HT-DP board

a. Remove the case referring to 5-1.

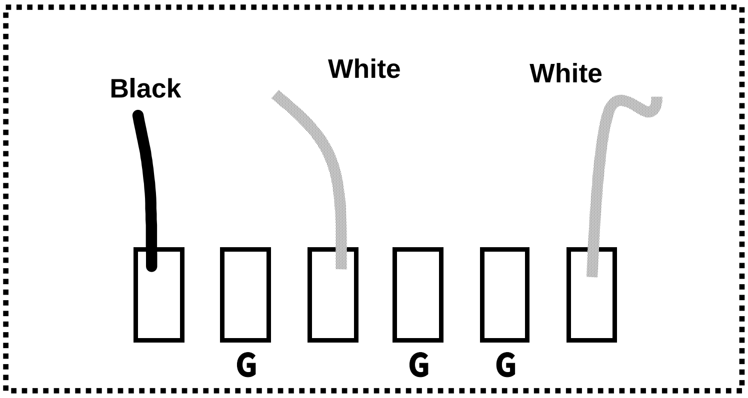
b. Remove wires to tuning-fork sensor by welding solders at HT-DP board.

c. Loose and remove fixing screws.

d. Pull out all connectors, and remove HT-DP board.



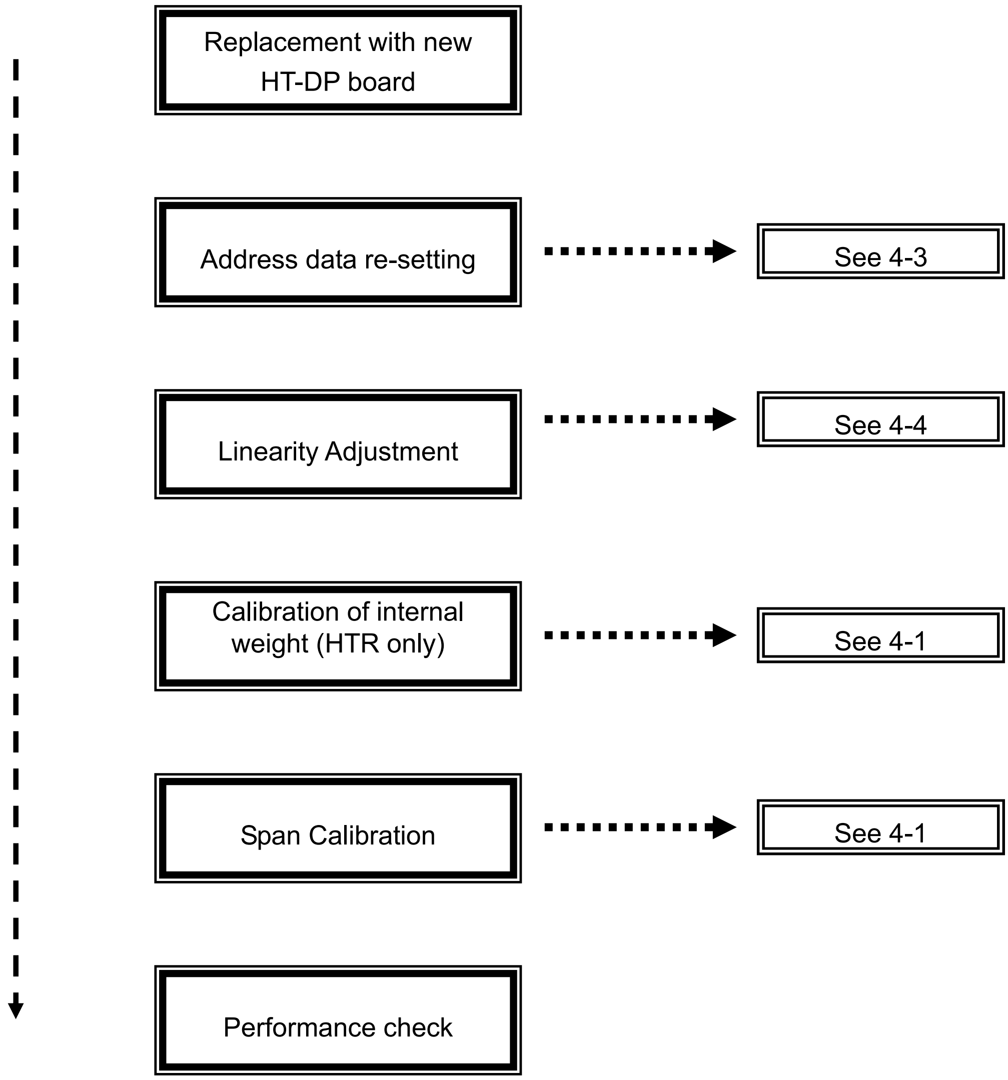
e. Solder wires of tuning-fork sensor to HT-DP board.



f. Plug connectors.

g. Place HT-DP board on the chassis, and fix the screws.

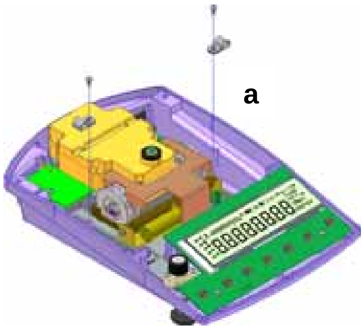
2. Adjustment after the replacement of HT-DPboard



5-3 The Sequence of Mechanical Unit Replacement

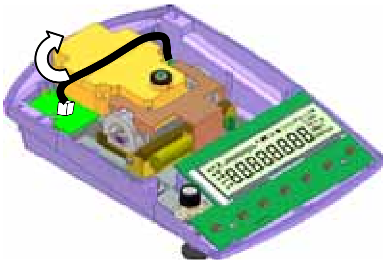
1. How to remove the mechanical unit

a. Open the case and remove nylon cramp fixing the connector cables.



a

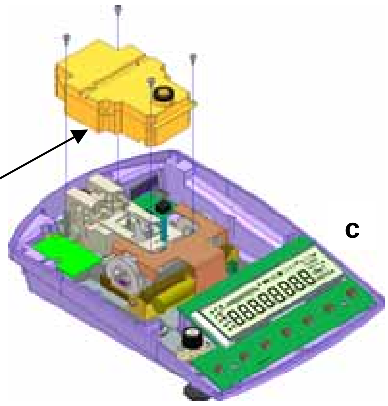
b. Pull out RS cable from LF board (power source board).



b

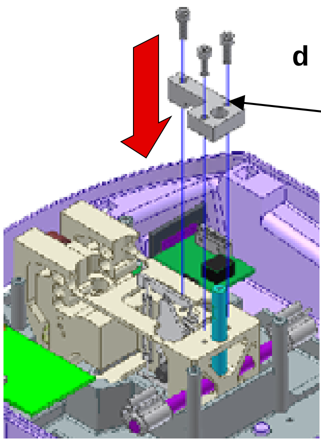
c. Loose four screws, and remove the sensor cover.

Sensor cover



c

d. Attach “mono-metal fixing block” to the mechanical unit.

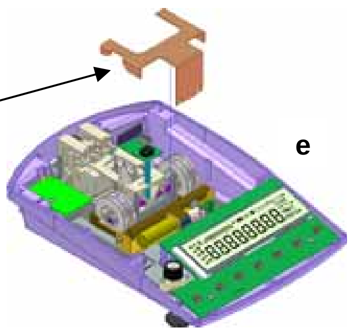


d

Mono-metal fixing block

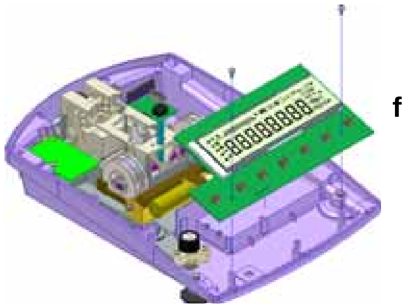
e. Loose two bolts fixing the weight stay, and remove the weight stay.

Weight stay

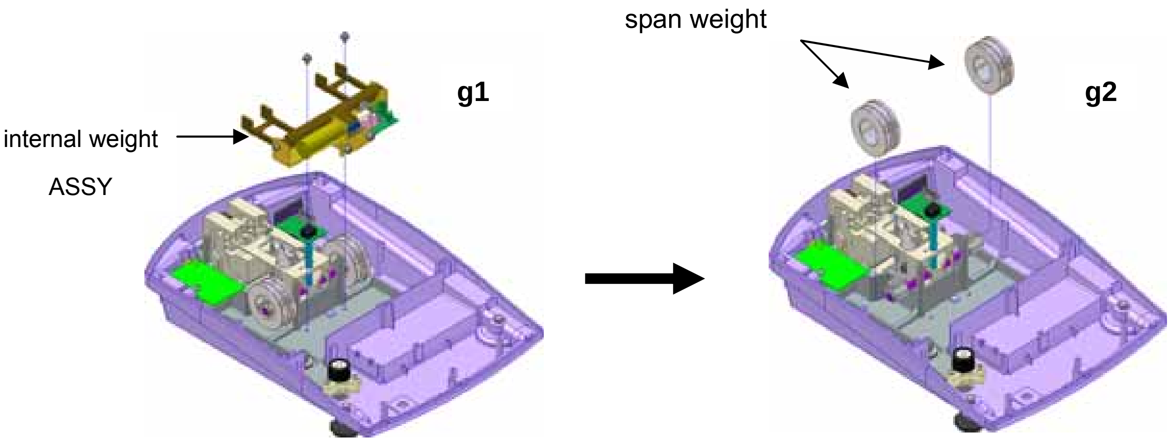


e

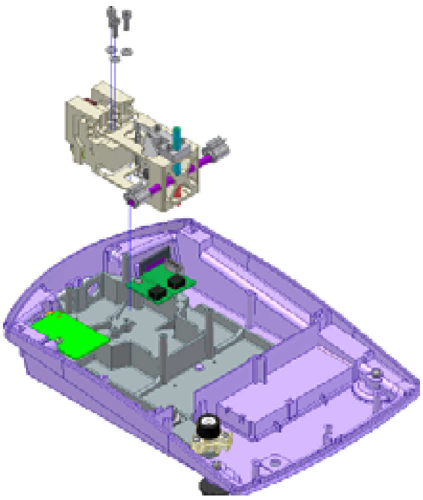
f. Pull out the connectors and remove HT-DP board.



g. Remove internal weight ASSY first, and then
remove span weight.



h. Loose three screws, and remove
the mechanical unit.



2. How to install the mechanical unit

*please refer to the pictures in “How to remove the mechanical unit”.

a. Attach the “mono-metal fixing block” to the mechanical unit

b. Put the mechanical unit in the chassis (torque:20kgfcm)

c. Install the span weight.

d. Connect the connector cables to HT-DP board. And attach HT-DP board to the lower case.

e. Remove “mono-metal fixing block” form the mechanical unit.

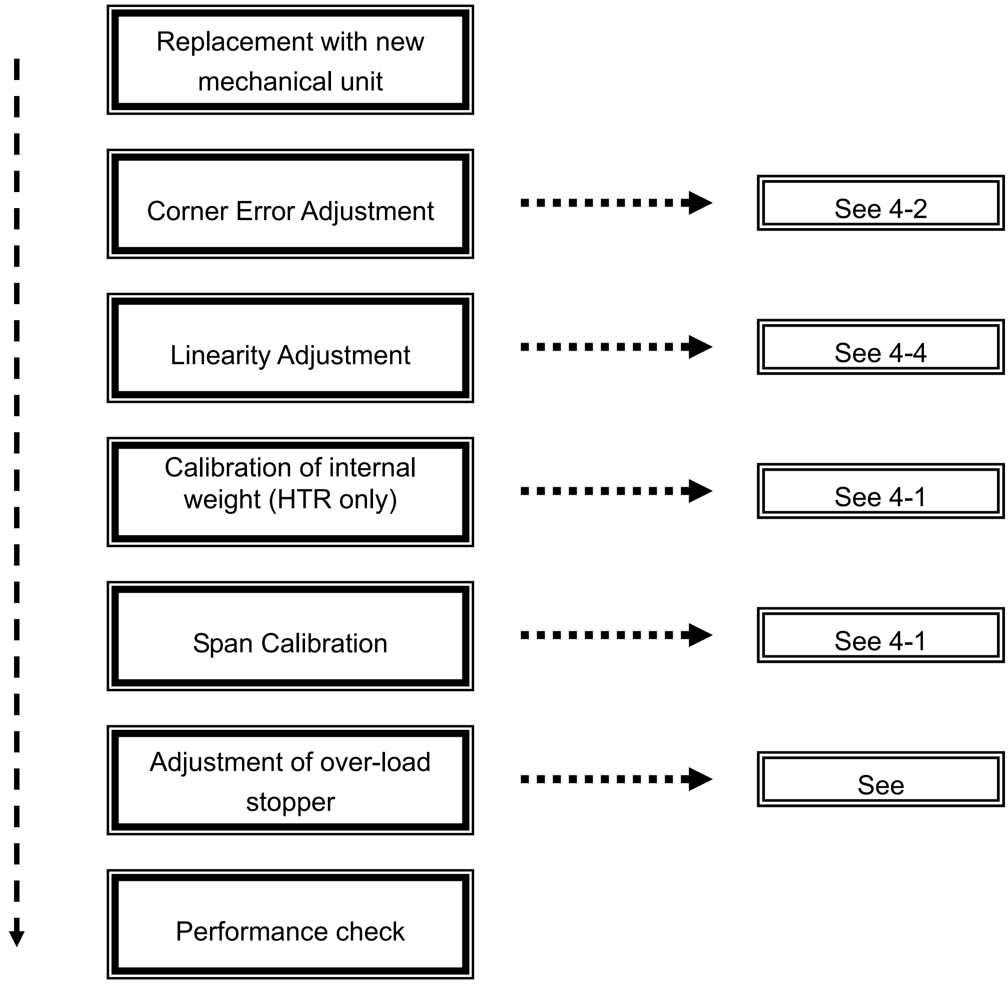
f. Install the weight stay.

g. Put the sensor cover.

h. Connect RS cable to LF board (power source board), and attach the nylon cramp.

3. Adjustment after the replacement with new mechanical unit

In case of any defection in the mechanical unit, the mechanical unit should be replaced with new one. After the replacement with new mechanical unit, please make following adjustment and setting.

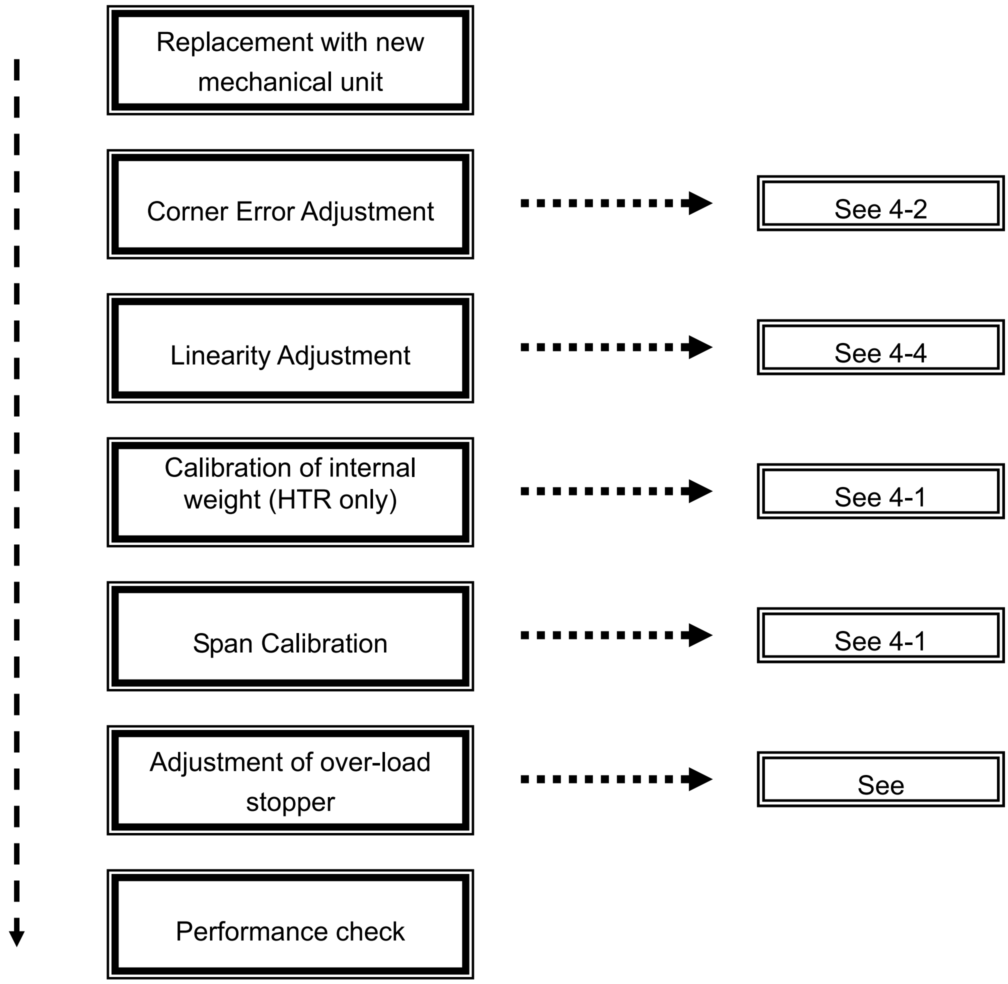


5-4 The Sequence of tuning-fork sensor

1. How to replace the tuning-fork sensor

1. Remove the mechanical unit from the chassis (see 5-3). Leave “mono-metal fixing block” attached to the mechanical unit.
2. Loose two bolts and remove the tuning-fork sensor.
3. Install new tuning-fork sensor to the mechanical unit with two bolts (torque: 20kgfcm).
4. Install the mechanical unit to the chassis (see 5-3).

2. Adjustment after the replacement of tuning-fork sensor



Appendix

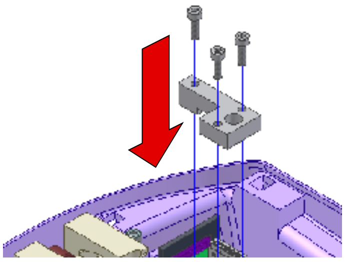
Table of Recommended Minimum Criteria for Adjustment

	Repeatability *1	Corner Error *2	Non-Linearity
HT(R)-80	0.0001g	±0.0005g	±0.0003g
HT(R)-120	0.0001g	±0.0005g	±0.0003g
HT(R)-220	0.0001g	±0.0005g	±0.0003g

*1 standard deviation *2 1/3 of full capacity loaded

Repair Tool List

1. Mono-metal fixing block



2. Stopper adjustment block

